REMARKS

Claims 12-21 have been added. Claims 1-21 remain in the Application. Following discussion regarding patentability of the claims is directed toward the claims as amended herein. Reconsideration and reexamination is respectfully requested.

REGARDING 37 C.F.R 1.84(h)(3) OBJECTION TO THE DRAWINGS:

In item 1 on page 2 of Paper 2, dated November 20, 2002, Examiner objected to the figures alleging that "the figures are improperly cross hatched". Appropriately modified formal drawing are submitted with this amendment by means of accompanying "Drawing Transmittal Letter". Applicant believes that the new formal drawings overcome this objection.

REGARDING 37 C.F.R 1.84(p)(4) OBJECTION TO THE DRAWINGS:

In item 2 on page 2 of Paper 2, Examiner objected to the figures as allegedly failing "to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description:

(i) Reference numeral 115 not shown in figure1.

(ii) Reference numeral 156 not shown in figure 5.

(iii) Figure 2 and 6, are not clear as the conductive area and openings on ground/power layer and the signal trace on signal layer are not matching with the description."

Appropriately modified formal drawing are submitted via accompanying "Drawing Transmittal Letter" wherein (1) reference number 115 has been substituted for previously appearing reference number 108 on Figure 1, (2) reference numeral 156 has been added to Figure 5, and (3) layers previously numbered 130 and 135 in Figures 2 and 6 have been removed for clarity of illustration and some remaining layers have been renumbered to be consistent with the description in the specification. Applicant believes that new formal drawings for Figures 2 and 6 overcome this objection.

REGARDING INFORMALITIES OBJECTION:

In item 3 on page 3 of Paper 2, Examiner objected to the disclosure for the alleged "following informalities:

(i) Reference numeral '115', page 5, line 18, is not show[n] in figure 1. Either it is wrong in the figure or in the specification.

(ii) In describing figure 2 and 6, the conductive area 165 and open area 170 are described on power/ground layer 140, but shown on layer 150.

also the location of signal trace 155 is shown on power/ground layer 140."

Appropriately modified formal drawings are submitted via accompanying "Drawing Transmittal Letter", wherein (1) reference number 115 has been substituted for previously appearing reference number 108 on Figure 1 and (2) layers previously numbered 130 and 135 in Figures 2 and 6 have been removed for clarity of illustration and some remaining layers have been renumbered to be consistent with the description in the specification. The conductive area 165 and open area 170 are now correctly shown on power/ground layer 140 in Figures 2 and 6. Applicant believes that new formal drawings for Figures 2 and 6 overcome this objection.

REGARDING 35 U.S.C. § 112 REJECTION OF CLAIMS 1-11:

In item 5 on page 3 of Paper 2, Examiner rejected claims 1-11 under 35 U.S.C. 112, second paragraph, as allegedly "being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention." Paper 2 further alleged that "The term 'laminate' in claims 1-11 is used by the claim to mean, "a printed circuit board with integrated circuit attached to the board," while the accepted meaning is "to roll or compress into a thin plate and a product made by that process." Applicant respectively traverses.

Among the accepted definitions of the VERB "laminate" is "To make by uniting several layers" and of the NOUN "laminate" is "A laminated product, such as plywood." [The American Heritage College Dictionary, 3rd ed., Houghton Mifflin Company, Boston, page 761 (1993)] The term "laminate" is commonly used in the printed circuit board industry to describe a composite of more than one layer laminated together, the lamination being typically performed under pressure at an elevated temperature. Applicant refers Examiner to attached Exhibit A which is a copy of a glossary of printed circuit board related terms found at internet web page

"http://hexcelschwebel.com/Tools/Glossary/Default.htm" which was visited on February 9, 2003. Exhibit A discloses on page 2 that "Multi-Layer Laminate" is "An electrical laminate that uses three or more layers of circuitry. These laminates are used in complex, high density circuit designs." Thus, Applicant's use of the term "laminate" is correct.

REGARDING 35 U.S.C. § 103(a) REJECTION OF CLAIMS 1-11:

In item 7 on page 4 of Paper 2, Examiner rejected claims 1-11 under 35 § U.S.C. 103(a) as allegedly being unpatentable over Tanahashi, U.S. Patent No. 5,184,477 entitled "Multi-Layer Circuit Substrate Having Orthogonal Grid Ground and Power Planes", hereinafter *Tanahashi*. Applicant respectively traverses.

The following quotation of 35 U.S.C. § 103(a) forms the basis for all obviousness rejections set forth in Paper29.

> "A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not negated by the manner in which the invention was made."

And, the following quotation from MPEP 2142 specifies the conditions which must be met to establish a *prima facie* case of obviuosness.

> "To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations."

With respect to claim 1, paper 2 admits that the traces disclosed in *Tanahashi* are orthogonal but alleges that "the crux of the invention of Tanahashi is routing the traces in such a way, not to intersect the opening in the ground plane layer." However, Applicant notes that the crux of the invention of *Tanahashi* is NOT to minimize or reduce the length of the conducting traces. In the

Present Application, the openings in the ground plane layer are laid out such that the traces can be run non-orthogonally, which is typically a shorter route, while not overlaying the ground plane layer openings. One advantage of embodiments of the Present Invention is that the lengths of conducting traces can be reduced WHILE the conducting traces do not overlay openings in the ground plane layer. This is an advantage over the invention of *Tanahashi*. Paper 2 also alleges that the "actual orientation will depend upon the specific requirement of the system", *Tanahashi* ONLY discloses traces that are orthogonal. Further, Applicant notes that if the traces in *Tanahashi* were laid out non-orthogonally in the layouts that he discloses, ground plane openings would be overlaid by the traces. *Tanahashi* does NOT disclose laying out the open areas in the ground plane such that a non-orthogonally laid out trace will not overlay the openings. Thus, using the teachings of *Tanahashi* with non-orthogonally laid out traces would not result in a success, as the traces would typically overlay one or more of the openings in the ground plane layer.

Thus, the Present Invention is not obvious in view of *Tanahashi* for the following reasons: (1) there is NOT a suggestion or motivation in *Tanahashi* or in the knowledge generally available to one of ordinary skill in the art, to modify *Tanahashi* to include orthogonally laid out traces or to lay out the openings in the ground plane layer such that orthogonally laid out traces do not overlay the openings, (2) as shown above there is not a reasonable expectation of success as non-orthogonally laid out traces as disclosed in *Tanahashi* without an appropriate relay out of the ground plane openings would result in traces overlaying the openings in the ground layer, and (3) *Tanahashi* does NOT teach or suggest all the claim limitations." Thus, claim 1 is allowable.

Similar arguments as to those made above with respect to claim 1 are applicable to claims 2-11. Since claims 2-11 depend from independent claim 1, they incorporate all of the limitations of claim 1 and are therefore allowable for the reasons listed above.

NEW CLAIMS 12-21:

For reasons readily apparent, new independent claim 12, as well as new dependent claims 13-21, are also allowable.

CONCLUDING REMARKS:

In conclusion, Applicant has overcome the objections of Paper 2. Applicant has further demonstrated that claims 1-11 of the Present Application are not obvious in view of *Tanahashi* and that claims 1-11 are allowable. Additional claims have been added in this response/amendment which Applicant also believes are allowable.

Entry of this amendment is respectfully requested. This application is considered to be in condition for allowance and such action is earnestly solicited.

Respectfully submitted,

by _____

Morley C. Tobey, Jr.

Reg. No. 43,955

February 16, 2003

Loveland, CO 80538

(970) 669-1266

VERSION OF CLAIMS WITH MARKINGS TO SHOW CHANGES MADE

The following Claims have been added:

12. A printed circuit board for interconnecting an integrated circuit chip, which comprises:

a laminate comprising:

a first layer, wherein the first layer comprises an electrically conducting area and multiple open areas, wherein an outer perimeter of the printed circuit board defines the axes of a Cartesian coordinate system, and wherein the open areas are interspersed inside an outer perimeter of the electrically conducting area;

a second layer, wherein the second layer is electrically insulating, wherein the second layer overlays the first layer; and

a third layer, wherein the third layer comprises multiple electrically conducting traces, wherein the third layer overlays the second layer, wherein at least one of the traces is oriented at other than an orthogonal angle to each axis of the coordinate system, wherein the oriented trace is longer than the spatial extension between two of the open areas, and wherein the projection of the oriented conducting trace onto the first layer lies external to the open areas.

13. The printed circuit board as recited in claim 12, wherein the open areas on the first layer sum to a total open area of at least 10 percent and less than 30 percent of the total area of the first layer.

14. The printed circuit board as recited in claim 12, further comprising:

the integrated circuit attached to the printed circuit board.

15. The printed circuit board as recited in claim 12, further comprising:

a substrate attached to the laminate.

16. The printed circuit board as recited in claim 12, wherein the printed circuit board is mounted in an integrated circuit package.

17. The printed circuit board as recited in claim 12, wherein the second layer material is selected from the group consisting of epoxy resin and teflon.

18. The printed circuit board as recited in claim 12, further comprising:

a fourth layer, wherein the fourth layer is electrically insulating, wherein the first layer overlays the fourth layer; and

a fifth layer, wherein the fifth layer comprises at least one electrically conducting trace, wherein the fourth layer overlays the fifth layer, wherein at least one of the traces is oriented at other than an orthogonal angle to each axis of the coordinate system, wherein the oriented trace is longer than the spatial extension between two of the open areas, and wherein the projection of the oriented conducting trace onto the first layer lies external to the open areas.

19. The printed circuit board as recited in claim 18, wherein the second layer and the fourth layer materials are selected from the group consisting of epoxy resin and teflon.

20. The printed circuit board as recited in claim 12, wherein the open areas have a repeating shape and a repeating size.

21. The printed circuit board as recited in claim 20, wherein the open areas have a repeating orientation with respect to a Cartesian coordinate system.

Adhesive
A thermoset resin (e.g., epoxy, phenolic or BMI) in the form of a thin film or paste, cured under heat and pressure to bond a wide range of composite, metallic and honeycomb surfaces.

Aramid
A high strength, high stiffness fiber derived from polymid. Kevlar(tm) and Nomex(tm) are examples of aramids.

Carbon Fiber
Fiber produced by carbonizing precursor fibers based on PAN (polyacrylonitrile), rayon or pitch. The term is often used interchangeably with graphite. However, carbon fibers and graphite fibers are made and heat treated at different temperatures and have different carbon contents.

Composite Material
Product made by combining two or more dissimilar materials such as fibers and resins to create a product with exceptional structural properties not present in the original materials.

Copper Clad Laminate
The basic building material for printed wiring boards. The laminate uses resin-coated fiberglass and external plies of copper foil which are cured in high-pressure flat presses.

Cowls or Cowling
The outside protective shell of a jet engine, traditionally made out of metal. Cowls mainly provide the engine with protection from the elements and with structural support.

Dimensional Stability
A measure of an electrical laminates dimensional movement (in three dimensions) when exposed to temperature cycles.

Engineered Products
Completed composite components that typically are manufactured from prepregs, honeycomb, adhesives and assembled hardware. These parts are ready for direct attachment to a structure (e.g., aircraft) or to sub-assemblies. Emerging manufacturing processes allow the fabrication of engineered products directly from reinforcing fibers/fabrics and matrix resins.

Fairing
A secondary structure of an airplane providing enhanced aerodynamics. Typically, fairings are found where the wing meets the body or at various locations on the leading or trailing edge of the wing.

Fiberglass

EXHIBIT A

Filaments made by drawing molten glass. Woven by Hexcel Schwebel into fabrics and commonly used as a composite reinforcement.

Filament Winding
A process to manufacture composite materials components such as rocket casings and cylinders. Fiber filaments are impregnated in a resin matrix and then wound in a predetermined pattern over a form of the desired component.

Honeycomb
A unique, lightweight, cellular structure made from either metallic sheet materials or non-metallic materials (e.g., resin-impregnated paper or woven fabric) and formed into hexagonal nested cells, similar in appearance to a cross-section of beehive.

Inlet Ducts
Intake passages or tubes that confine and conduct air. They are usually located at the upstream end of an airplane engine on the engine cowling and aid in propulsion and engine cooling.

Interiors
Finished internal aircraft components, such as overhead stowage compartments, lavatories, sidewalls, floor panels and ceilings.

Kevlar(tm)
An aramid fiber from DuPont. Woven Kevlar(tm) fabrics are used in both ballistic and composite materials applications.

Modulus of Elasticity
The physical measurement of stiffness in a material. A high modulus indicates a stiff material.

Multi-Layer Laminate
An electrical laminate that uses three or more layers of circuitry. These laminates are used in complex, high density circuit designs.

Nacelle
The protective shell of a jet engine housed within the cowling, usually made from honeycomb. Provides noise absorption, insulation, structural support and can aid heat dissipation.

Nomex(tm)
DuPont's registered trade name for its high temperature resistant aramid papers, pressboard, staple fibers and filament yarns. Nomex(tm) aramid paper is used in the manufacture of honeycomb.

PAN (Polyacrylonitrile)
A polymer which when spun into fiber is used as a precursor material in the manufacture of certain carbon fibers.

Precursor
The PAN, rayon or pitch fibers from which carbon or graphite fibers are derived.

Prepreg (Pre-impregnated)
A composite material made from combining high performance reinforcement fibers or fabrics with a thermoset or thermoplastic resin matrix. When cured under high temperature and pressure, exceptional structural properties are achieved.

Printed Circuit Board
An electronic platform containing etched copper circuitry and multiple layers of interconnected circuitry, and assembled with microprocessors, passive devices and other electronic components.

Primary Structure
A critical load-bearing structure on an aircraft. If this structure is severely damaged, the aircraft cannot fly.

Radome
The housing which protects the aircraft radar system from the elements while allowing transmission of radar signals. Often the radome is in the nose of an aircraft but can be found at other locations on the aircraft, as well.

Reinforcement
A strong material which when combined with a resin matrix forms a composite material. Reinforcements are usually continuous fibers, which may be woven. Fiberglass, aramid and carbon fibers are typical reinforcements.

Reinforcement Fabrics
Woven fiberglass, carbon or aramid fabrics used in production of prepregs and honeycomb.

Repair and Retrofit
The reinforcement or repair of existing structures to strengthen them or increase their ability to withstand an earthquake or other forces. Until recently, repair and retrofit was done with traditional materials like steel. Now it can also be done with composite materials which are lighter weight and cost competitive with traditional materials.

Resin Matrix
In reinforced fiber composites, a formulated polymeric substrate.

Rigid Laminate
A one or two sided copper clad standard electrical laminate used in low cost applications. Usually uses eight plies of 7628 fiberglass fabric.

Sandwich Panels
A stiff and lightweight panel consisting of thin sheets such as aluminum or cured prepreg laminate bonded to a low density, rigid core material (e.g., foam or honeycomb).

Seismic Retrofit
The reinforcement of existing structures to increase their ability to withstand an earthquake. Until recently, the reinforcement was done with steel, but now it can also be done with composite materials.

Special Process Honeycomb
The forming, shaping, machining or bonding of sheets or blocks of honeycomb into profiled and complex shapes for use as

semi-finished components in the fabrication of composite parts and structures.

Spectra(tm)
A high strength polyolefin fiber from Allied Signal. Woven Spectra(tm) fabrics are very strong and lightweight and are used in both ballistic and composite materials applications.

Structures
Finished components for aircraft and industrial applications. For aircraft, these may be for primary or secondary external structures. Truck applications include chassis fairings and floors.